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This paper is part of a current dissertation project exploring the relationships between constructs in linguistic theory and pattern of language behavior in aphasic adults. The author feels that linguists have done little enough work in the area of speech pathology yet they have discussed at length the distinction between competence and performance. He believes that the loss or the impairment of language abilities as concomitants of organic lesion in the central nervous system can, when judiciously examined, provide linguists with an insight into the structure of language. Discussed are some aphasic language data from two patients with whom the author has worked and also from some research done by speech pathologists at the Mayo Clinic. The author concludes by pointing out areas for further research. (DO)

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Linguistic Competence: Evidence from Aphasia

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[The staff of the Aphasia Clinic at the Long Beach Veterans Administration Hospital has made it possible for me to work with aphasic patients.]

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The contribution of linguistic theory to behavioral and neuroscience can be broadly characterized as the specification of linguistic competence--the underlying idealized structure which represents what a speaker knows about his native language. The mistakes which occur in the actual use of language, or, to express it more accurately, the fact that normal language behavior is only an approximation to the grammar specified by linguistic theory, is properly the concern of the psychological and neurological sciences. In other words, matters of performance are not in the immediate domain of linguistic theory.

Of course, linguistic hypotheses do not materialize in a non-language context; they are derived from performance data--from intuitions about one's own dialect, from informal questioning of another person's dialect, or from more structured field methods. And since it is most desirable that such data be as free as possible from the errors normally found in performance, it is not surprising that the linguist's own intuition is most heavily relied upon. Additional justification for these linguistic research techniques is undoubtedly to be found in the fact that analyses of verbal behavior have primarily been either derivative, such as studies of the processing time and memory capacities for transformational rules, or else not directly comparable to linguistic hypotheses, such as studies of rhythmic structures, word frequencies and the like. To put it charitably, a linguistic interest in the structure of language has not been similar to a neuropsychological or neurophysiological interest in the production and recognition of language.

It is not the intention of this paper to question either the research

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techniques or the competence/performance assumption of linguistic theory, but instead to point out an important and accessible area of empirical research that is being largely neglected by linguists--aphasia. The loss or the impairment of language abilities as concomitants of organic lesions in the central nervous system, can, when judiciously examined, provide linguists with an insight into the structure of language. However, before suggesting some ways in which aphasic language may constitute evidence for hypotheses about linguistic competence, a caveat must be given.

The distinction between loss and impairment is important because we wish to separate those aspects of the verbal behavior of aphasics which are simply a quantitative reduction of normal verbal behavior, i.e. an impairment, from those aspects which are qualitatively different and thus indicative of loss. For example, one of the more well-known aphasic syndromes is anomia--a difficulty in naming things. In its milder form, e.g. the inability to recall from memory the name of someone or something, most people have experienced it; the inability to name simple objects such as a comb or a pencil when they are visually presented would be a severe impairment, or if one prefers, an extreme exaggeration of a normal performance error.[1] On the other hand, another well-known aphasic syndrome--telegraphic style--or utterances characterized by a lack of determiners, prepositions, auxiliary elements, etc., and in more severe cases, major lexical items such that an utterance might be merely a noun or a verb, seems to have no direct or obvious parallel in normal speech and ought to be described as a loss of some specific properties of linguistic structure.[2] The loss of some part of the linguistic system is a fairly clear notion, then, although it is a bit hard to pin down experimentally. The impairment of some part of the linguistic system is less easy to define; it represents an extreme on some scale of performance errors which in normal speech are due to a lack of

attention, the shortness of memory span, and the like.

Obviously the preceding descriptions are over-simplified; the distinction between loss and impairment cannot be empirically absolute. However, the purpose of the theoretical distinction should be fairly evident. If one can analyze a loss of language ability in terms of linguistic competence, i.e. in terms of a hypothesis about the form or content of the grammar, then it is reasonable to assume that the linguistic hypothesis is in fact empirically verified and not simply an accident of linguistic theory or an accident of the linguist's introspection about his own speech habits. The loss of X due to lesion can be considered evidence that X is part of the competence of a normal native speaker.

It could conceivably be argued that organic damage to the nervous system does not affect linguistic competence, i.e. that aphasia only represents a quantitative reduction or impairment in performance and as such is of marginal empirical interest to linguists. The reductio ad absurdum of this view is, of course, clear--with maximally severe brain damage there is no evidence of language at all, either externally or internally; under such conditions it seems specious to assume that competence is somehow intact.

In the remainder of this paper I will briefly discuss some aphasic language data from two patients with whom I have worked and also from some research done by speech pathologists at the Mayo Clinic; this data may provide some evidence for both the form and content of the grammar. Space limitations are such that the clinical neurological data will not be discussed.

In conversational speech patient WL in general does not communicate well; his speech is filled with anaphoric NP's with no referents as well as an abundance of indefinite NP's. His spontaneous language is largely a succession of incompleted sentences which, nevertheless, seem to have correct syntactic structure at least at the phrasal level. For example, consider the following conversation :

WL too much of this has gone away, buddy; I'm just knocked out right now; for some reason or other; some of this stuff, I think it, possibly tomorrow, if you were coming back
HW I'll probably be back on Monday
WL sometimes it happens to me here; I hadn't done it this way; I just wouldn't do anything about it; now I'm trying to, and all of a sudden I find out that it's not doing the way it should, and I can see, I've said it time after time after time; and I'm going to continue to push it on these people until they get this thing back in shape here, so at least I have this much of it pushed together; then I can go into things like this and start working with it. Because a lot of the things that you and I are talking about right now are just doing a little piece of the thing. If I had a ... book, not "A" book, book after book after book of these things, I would slowly get these things going back into them because there's a tremendous amount of this thing that I've got to be pushing and pushing and pushing...[mumbled here]...just goes sideways, I mean I can't, it just goes sideways, I'm sorry about this
HW no, it's kind of hot in here, and it's a very small room and it's late in the afternoon
WL well I'd like to put I don't know where I am doing at these points, I, I'm a, ridiculous at this point...one of these days it will come back to me and I'll be using it; one of the things I've got to push is this thing back into place, so I'm pushing it

What WL's disorder suggests is a breakdown of the semantic component such that the conceptual organization of the sentence is no longer an intact concept. I am of course aware that one does not normally utter a succession of grammatical sentences; however, one normally does manage to produce a succession of complete sententially-organized concepts. WL's disorder may have <u>some</u> syntactic consequences, but primarily it leads to the production of sentences that are semantically unacceptable. For example, when given a word and asked either to use it in a sentence or explain what it means, WL produces utterances like those in #2 below. To minimize any potential modality defects such as hemianopia or word-deafness, all stimuli words in all experiments were presented both verbally and in writing; responses were elicited both as written and spoken for the same reason. Where two types of responses are different, the verbal and written ones are given separately:

(2)	stimulus word	WL's response
a.	under	there is under a horse a new side saddle
b.	next to	next to me is a new return
c.	behind	it is behind the end
d.	out of	out of the end is the middle
e.	perform	sometimes we perform more requirements
f.	amaze	I was amazed with this foot
g.	argue	I argue a girl
h.	challenge	I'll challenge a new bike

You will note that in utterances (a) through (d) the syntactic constraints on the prepositions are acceptable but he apparently does not know their meaning. To support this he was given another task in which he was asked to tell me whether an object, a lighter, was behind, in front of, under, on top of, etc., other objects such as an ashtray or a table. WL was totally unable to do this, indicating minimally that he had lost the semantic features of the locative prepositions; he <u>used</u> locative prepositions in his response, but almost invariably he used the incorrect one.

To further examine the hypothesis that WL had a defective semantic concept of sentencehood, he was given a set of 8 cards, each of which had a single word printed on it as indicated:

(3)	AT	LITTLE	RED	LOOK
	APPLE	THE	WILL	YOU

WL first arranged a phrase on the table to read THE LITTLE RED APPLE; next he placed WILL LOOK, and finally, in a row underneath these he arranged AT YOU and read off to me, "The little red apple will look at you!" After I had placed the cards correctly, I gave WL another card with the word NOT on it; he was able to place it in its correct position. After replacing the card with WILL on it with one reading DID, so that the sentence now read "You did look at the little red apple," WL was <u>not</u> able to rearrange the cards to form a question. Several other attempts with different sentences on cards produced the same results. Incidentally,

WL was also unable to change verbally presented simple statements into questions. Whether this indicates a difference in the nature of a permutation rule like QUESTION contrasted with an insertion rule like NEGATIVE, or whether this has some bearing on the scope of negation, remains to be investigated. Eventually a study will have to be made of the particular semantic features which seem to have been lost in WL's linguistic system; this could lead to some stronger claims as to what the semantic concept of sentence is comprised of.

Another patient, KT, who in my judgment seems to have a relatively intact semantic sense of the sentence and connected discourse, appears to have some highly specific syntactic and lexical losses. For example, he has great difficulty in making a single complement sentence from the two putative underlying sentences:

(4) stimulus sentences	KT's response sentence
a.i. They expect _____	a. I expect him tomorrow.
a.ii. He will come tomorrow.	
b.i. The colonel wanted _____	b. The colonel wanted you to have the foxhole.
b.ii. The colonel got into the foxhole.	
c.i. Michael persuaded _____	c. Michael persuaded them to go to the movie.
c.ii. I went to the movie.	
d.i. She approves of _____	d. She approved of cigarettes, or you could say, she approved of smoking.
d.ii. She smokes cigarettes.	
[3 weeks later, tested on (d)]	d'. She approved me to stop smoking.

What is suggested is that KT is capable of using complementizers, i.e., he can make the appropriate adjustments to the VP of the complement #S#, but that he cannot keep track of the NP's, particularly when it is necessary to do so for deletion or for the accusative rule. To check this two other tests were given. The first involved matching synonyms which included the complement-taking verbs

such as imagine, persuade, suggest, etc., to make sure he knew the semantic features of these words; KT had no difficulty with this task. The second test involved replacing underlined NP's with appropriate pronouns in a short narrative passage as follows; KT was unable to do this task successfully as shown by both his spoken and written responses:

(5) [narrative passage:identification numbers are not part of original test]

John and Susan are married. When John came home, John(1) asked Susan if Susan(2) wanted to take a trip. Susan(3) said 'yes'. So John and Susan(4) went to San Francisco. It was raining when John and Susan(5) arrived. John did not bring John's(6) raincoat; John(7) had left the raincoat(8) at home. However, Susan remembered to bring Susan's(9). While John and Susan(10) were in San Francisco, John and Susan(11) met Paul. Paul was an old friend who knew John and Susan(12) back in high school. John, Susan and Paul(13) all enjoyed the vacation.

	noun	KT's spoken response	KT's written response
(1)	John	I	I
(2)	Susan	I	her
(3)	Susan	she	her
(4)	John and Susan	we	I'm
(5)	John and Susan	we	I
(6)	John's	our	I
(7)	John	---	---
(8)	the raincoat	I	I
(9)	Susan's	him	her
(10)	John and Susan	we	I
(11)	John and Susan	we	he
(12)	John and Susan	---	---
(13)	John,Susan and Paul	we	I

[KT attempted numbers (7) and (12) but was unable to do them;he said,"I don't know"]

For now I have labeled this loss as a defective ability in making referential identities. It is probably related to a defect in the organization of short-term memory--notice, for example, that in the complement test on sentence (d), KT seems to have managed the deletion properly but first he left out the verb and then the object in the complement sentence. Further study is needed to characterize this loss in more exact terms.

From the foregoing it is apparent that I am inclined to consider the syntactic and semantic components of the linguistic system as distinct, or at least to argue that they may be separately disordered. Based upon some current research reported by F. L. Darley[3] and his associates at the Mayo Clinic, an even stronger case can be made for the independence of the phonological component. Darley has convincingly demonstrated that patients may have difficulties with the articulatory organization of words independent of <u>any</u> aphasic syndromes and independent of <u>any</u> defects in the motor control of the speech muscles. This disorder, commonly referred to as motor aphasia or expressive aphasia, he identifies as apraxia of speech; it is characteristic of persons with lesions in the left anterior cerebral regions, specifically in the 3rd frontal convolution, or what has been known as Broca's area. In his words, these patients exhibit:

> variable, off-target approximations of phonemes, often, though not exclusively, initial consonants. There is no significant weakness, paralysis or incoordination of the speech musculature. Such patients exhibit an effortful groping for the right articulation and for the right phoneme sequencing, which leads to a slower rate of speech, an excessive and equal spacing of words and an equalization of stress.

In contrast, lesions of the brain stem and cerebellar regions, i.e. sub-cortical areas, which interfere with the motor commands coming from the cortex and going to the speech musculature, may be collectively referred to as dysarthria. The several manifestations of dysarthria can be distinguished from apraxia and it can be argued that these two syndromes mirror in many respects the distinction made in linguistic theory between the phonological component and physical phonetics, where by the latter I mean the realization or actualization of the systematic phonetic representation. In dysarthria the patient will have spasms, weakness or paralysis of specific muscles of the head and neck, regardless of whether he is attempting to speak, smile, eat or anything else. Once it has been established which muscles are affected, it is easily possible to predict the

effects on the motor organization of speech. In apraxia, however, the defects are in the phonological organization of the motor commands rather than in the transmission line; the only motor activity that is affected is speech, and the effects are variable and apparently unpredictable. For example, a consonant cluster that is mis-articulated may be simplified on the first try, substituted for on the second attempt and then made more complicated on the third by the spurious addition of another consonant. As noted before, the syntactic and semantic systems are not impaired in either apraxia or dysarthria.

Rather than summarize by way of conclusion, I would like to mention some potentially interesting phenomena which I am very curious about but for which I have neither sufficient data nor explanation. The patients whom I've studied are apparently capable of handling conjunction accurately as long as some spontaneous speech is present. I have not encountered a loss or even serious impairment of conjunction short of nearly total language loss. I have also observed that if determiners are used at all, they seem to be used correctly; that is, definite, indefinite and generic NP's are correctly produced if there is a determiner system in the first place. One might describe this as an "all-or-none" phenomenon. Although I have not experimentally studied these aspects of the grammar, it would be most interesting indeed if it turned out that conjunction and the determiner system were very high in some hierarchy, that is, fundamental to English grammatical structure.

Notes

1. It has been pointed out in the literature that anomia generally is only a matter of the production of speech. The aphasic is usually capable of recognizing among several words the one he was trying to find. Patient WL, for example, uses pencil and paper as an aid to circumvent his anomia and this technique is quite successful. He seems to locate the first letter or two and then write out the desired word and finally, say it aloud.

2. Telegraphic style has been accounted for in the literature by assuming the aphasic has great difficulty in speaking and therefore only concentrates upon the important, information-bearing elements of the utterance. Although my direct experience with this syndrome is limited, there is at least one important empirical reason for rejecting this explanation. It does not account for the all-or-none appearance of the so-called 'function words' such as determiners, nor does it account for an analogous syndrome in the recognition of language--an inability to read these words, even in isolation; in such a recognition task, of course, the information load is fully carried by the word in question.

3. Darley's research was presented in a paper read to the American Speech and Hearing Association's annual convention, Denver, Colorado, on November 15-18,1968.